RIDING ON THE SIXTH WAVE

RENEWABLE ENERGY AND NANOTECHNOLOGY PATENTS

Dora Marinova
Curtin University of Technology
Outline

• Technological trajectories
• Patent evidence
• Political environment
• Need for a global green innovation system (GGIS)
History of technology

- Technology development seems to happen along certain technological trajectories (Perez and Freeman)
  A pattern of solutions based on highly selected principles derived mainly from the natural sciences together with specific rules aimed at acquiring new knowledge and safeguard it, whenever possible, against rapid diffusion to the competitors
Growth

Starting

Replicating and Improving

Stabilizing

Trajectory Paths to the Next Curve

Present Curve

Dying

Future Curve

Time
Technological waves

• 5-6 such significant major technological trajectories which in the tradition of Kondratieff, economists starting with Schumpeter (1939) describe as waves of innovation

• Each wave represents technological solutions to problems that once were thought intractable

• Aligned with the dominant technologies of the wave are methods of production, socio-institutional frameworks, government policies, political and economic organisation of society
Sustainable technologies

• Must be:
  – economically viable
  – environmentally friendly
  – socially acceptable and desirable

• Development and use of technologies:
  – shaped by the imperatives of the day
  – the values held in the organisations and individuals with the resources

• Sustainable technologies should simultaneously and synergistically include market profitability, environmental considerations and social accountability.

• The sustainable technology approach requires understanding of the interactions between technology and the social, ecological, economic, cultural, political and governance systems.
Knowledge and technology

• Database of US Patent and Trademark Office (PTO)
  – 1975-2005
  – By date of patent application
  – Keyword search

• Many problems with the patent system
  – Only a fraction of all inventions are patented
  – The existence of a patent does not give an indication about its significance
  – International differences between patenting systems
  – Only a small proportion of all patents are ever used (Edgerton, 2006)
  – Not affordable to everybody
  – Value system considerations

• What better information do we have?
Technology groups

• Renewable energy technologies – patented solutions in solar, wind, wave, tide, geothermal, hydro and biogas

• Nanotechnologies – perceived as inherently sustainable
  – Potential to reduce total volume of material per product function (less material waste)
  – Potential to reduce energy costs during use-phase of products
  – Allows for efficient energy conservation and storage
  – Nanoscale processes for environmental improvement (screening, treatment, remediation, benign manufacture, used in solar and fuel cells)

• but do they fit all the criteria?
  – Economic oppression from artificially inflated prices
  – Personal risk from criminal or terrorist use
  – Personal or social risk from abusive restrictions
  – Social disruption from new products/lifestyles
  – Environmental damage or health risks from unregulated products
    • Nanoscale contamination of water and air
  – Free-range self-replicators
  – Black market in nanotechnology
  – Unstable arms race (www.cnano.org/dangers.htm)

• green nanotechnology
Renewable energy

Absolute numbers

% of total
Nanotechnologies

Absolute numbers

% of total

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Sixth wave?

- There is evidence that the 6th wave is associated with the raise of nanotechnologies
- Renewable energy is still in its infancy

- The market economy is failing to endorse the new wave and if left to it alone would take dozens of years before it reaches the intensity of inventiveness required for tackling climate change
Innovation systems

  “Countries differ in the level of their investment in innovation, the roles of the public and private sectors, the industries and technology fields of greatest importance and the rates of change in those patterns, the level of cooperation among organisations, the modes of financing innovation, attitudes to risk taking, the regulation of the labour market and the role of large and small firms” (Scott-Kemmis, 2004)

• National patterns of specialisation which tend to persist over prolonged periods of time
• Commercialisation is a key component
• Explain why Japan and Germany have the highest number of renewable energy patents
Scientific evidence

• Fourth Assessment Report of the IPCC (2007):
  – shows record warm temperatures on Earth
  – increased incidents of weather calamities
  – faster raising sea level
  – other long-term detected phenomena include: “changes in Arctic temperatures and ice, widespread changes in precipitation amounts, ocean salinity, wind patterns and aspects of extreme weather including droughts, heavy precipitation, heat waves and the intensity of tropical cyclones” (IPCC, 2007, p. 5).
  – “Most of the observed increase in globally averaged temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations” (IPCC, 2007, p. 8).
Changes in Temperature, Sea Level and Northern Hemisphere Snow Cover

(a) Global mean temperature

(b) Global average sea level

(c) Northern hemisphere snow cover
Policy environment

- **Stern Review** (2006): “any delay would be dangerous and much more costly”

- **IPCC** (2007): “Global atmospheric concentrations of carbon dioxide, methane and nitrous oxide have increased markedly as a result of human activities since 1750 and now far exceed pre-industrial values…”

- **European Communities** (2008) The Economics of Ecosystems and Biodiversity (**Sukhdev**): “Most biodiversity and ecosystem benefits are public goods that have no price.... Countries, companies and individuals need to understand the real costs of using the Earth’s natural capital and the consequences that policies and actions, individual or collective, have on the resilience and sustainability of natural ecosystems.”
• Garnaut Review (2008)

“Climate change is a diabolical policy problem. It is harder than any other issue of high importance that has come before our polity in living memory. Climate change presents a new kind of challenge. It is uncertain in its form and extent, rather than drawn in clear lines. It is insidious rather than (as yet) directly confrontational. It is long term rather than immediate, in both its impacts and its remedies. Any effective remedies lie beyond any act of national will, requiring international cooperation of unprecedented dimension and complexity. While an effective response to the challenge would play out over many decades, it must take shape and be put in place over the next few years.”
Global green innovation system (GGIS)

• What are needed are not just national systems of innovation but super-national policies and innovation systems that can encourage the uptake of the green technologies
• GGIS should allow for development all across the globe, including the developing world
• GGIS will combine the power of science, R&D with financial institutions and attitudes towards risk; will generate the required skills and labour force across all sectors in individual countries (industry, government and education)
• The determining factor for climate change innovation to be endorsed globally and become the new 6th wave of innovation is for community to adopt a vision for a sustainable world.
• This will translate into changes in values and everyday practices as well as in a surge of activities in relation to patenting human inventiveness to support the transition towards a more sustainable future.
‘A global green new deal’
UNEPA report author urges world community to seize opportunity during economic crisis

By Henry Shon

The United Nations Environment Program recently commissioned a report entitled “A Global Green New Deal” which recommended that stimulus spending by various countries be focused on “green growth.”

In an interview with The Korea Herald, Ed Barbier, the author of the report and an economics professor at the University of Wyoming, outlines UNEP’s proposals and voices hope that the world’s wealthiest nations will adopt these initiatives at the upcoming G20 summit in April.

Barbier is a leading expert on the economics of sustainability and co-authored with the late professor David Pearce the landmark “Blueprint for a Green Economy.” Barbier’s “A Global Green New Deal” report was presented to more than 100 environment ministers who attended UNEP’s Governing Council/Global Ministerial Environment Forum in Nairobi, Kenya, from Feb. 16-20.

Korea Herald: In the report, you say the world community has a unique opportunity in the midst of this economic crisis. Can you explain to our readers how the current crisis can spark a green revolution?

Barbier: Reviving growth, ensuring financial stability and creating jobs should be essential objectives in such a severe recession. But unless economic recovery initiatives also address other global challenges, such as reducing carbon dependency, protecting ecosystems and water resources and alleviating poverty, their impact on averting future crises will be short-lived.

Without this expanded vision, restarting the world economy today will do little to address the imminent threats posed by climate change, energy insecurity, growing freshwater scarcity, deteriorating ecosystems and, above all, worsening global poverty.

To the contrary, it is necessary to reduce carbon dependency and ecological scarcity not just because of environmental concerns but because this is the correct and only way to revitalize the economy on a more sustained basis.

It is therefore essential that a Global Green New Deal (GGND) contains three core elements: 1) Revive the world economy, create employment opportunities and protect vulnerable Continued on Page 4
Conclusion

The 6th wave is in its infancy
Nanotechnologies alone cannot provide the change needed to reduce carbon
Left to individual NIS – a diabolical problem
Cooperation is needed

Global green innovation system (GGIS) can be the solution
Thank you